

Appl. No. : 10/068,423
Filed : February 4, 2002

REMARKS

Claims 1, 3-4, 6-12, 25, 28, and 40-60 are pending in the application and are presented for additional examination and allowance. Applicant has canceled Claims 2 and 5 and canceled previously withdrawn Claims 13-24, 26, 27, and 29-39. Additionally, Applicant has added new Claims 49-60.

Discussion of Rejections Under 35 USC § 112

The Examiner rejected Claims 1-12, 25, 28, and 40-48 under 35 USC § 112 as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Applicant has amended Claims 1, 8, 25, 28, and 40-44 to overcome the rejections. In particular, Applicant has amended Claims 1 to recite the structural elements of a photodiode. Applicant has also amended Claim 8 to configuration of the windows in the cathode. Claims 25 and 28 were amended to be independent claims that include all of the process steps of the withdrawn base claims from which they originally depended.

Dependent Claims 3-4, 6-7, 9-12, and 45-48 are believed to be distinct following the amendments to the independent claims from which they depend. Applicant respectfully requests reconsideration and withdrawal of the rejections under 35 USC § 112.

Discussion of Rejections Under 35 USC § 102(b)

The Examiner rejected Claims 1-12, 25, 28, and 40-48 under 35 USC § 102(b) as allegedly anticipated by U.S. Patent No. 6,100,570 to Saito.

In order for a reference to anticipate a claim, the reference must teach or suggest all claim limitations. The Saito reference fails to teach or suggest all of the limitations of the Applicant's claims, as amended.

Claim 1 recites a photodiode array comprising a stacking structure disposed on a first surface of a semiconductor substrate. The stacking structure includes at least one semiconductor layer for making a junction for photoelectric conversion that is substantially parallel to a surface of the substrate. Additionally, an electrode is formed on the second surface of the substrate and includes windows located at positions corresponding to sections of the stacking structure for

allowing incident light to pass through the second surface of the substrate. Claim 44 also includes a similar stacked structure.

Saito fails to disclose the claimed stacked structure having light absorbing regions. Thus, Saito fails to teach each and every element of the claims.

In Saito, Fig. 7 and the description at Col. 9 ll. 7-10, the photodiode does not include a stacking structure having a junction for photoelectric conversion that is substantially parallel to the surface of the substrate. As shown in Saito Fig. 7, the device includes a P-type layer 79 connected to an anode 78 and an N⁺-type layer 76 connected to a cathode 77. The cathode 77, anode 78 and doped layers 76 and 79 are all disposed on the same side of a substrate 74. Moreover, the P and N layers 79 and 76 respectively, are not part of a stacking structure, but, in contrast, are formed horizontally to one another.

Thus, Fig. 7 of Saito and the associated description fails to describe or suggest “a stacking structure including at least one semiconductor layer formed in said structure for making a junction for photoelectric conversion, the junction being substantially parallel to said first surface.” Additionally, Saito, Fig. 7 fails to teach or suggest “a second electrode formed on said second surface” of the substrate. Therefore, Saito, in Fig. 7 and the associated description fails to teach or suggest all of the claimed features.

Saito, in Figs 9(b) through 9(d) and 10 fails to disclose each and every claim limitation. Claim 1 also includes “at least a trench formed in said stacking structure and dividing said stacking structure into sections” as well as “windows formed in the second electrode and located at positions corresponding to the sections of the stacking structure for allowing the incident light to pass through said second surface.” Saito, in Figs 9(b) through 9(d) and 10 fail to teach or suggest these features.

Saito, in Figs 9(b) through 9(d) and 10 fails to disclose a trench formed in a stacking structure. In the associated description, Saito states: “in the APD made by the present invention, the semiconductor base-substrate is removed.” Col. 11 ll. 51-52. Thus, because the substrate is removed, there cannot be “windows formed in the second electrode and located at positions corresponding to the sections of the stacking structure for allowing the incident light to pass through said second surface.” In fact, the substrate is removed from the area in which light passes. Because there is no substrate, there cannot be an area in the second surface of the

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substrate in which light passes. Therefore, Saito, in Figs 9(b) through 9(d) and 10 fails to teach or suggest all claimed features. Applicant respectfully requests reconsideration and allowance of Claim 1.

Similarly, Claim 8 includes "a cathode deposited on said second surface, wherein said cathode comprises windows formed therein and exposing an area on the second surface corresponding to at least a portion of the light receiving region." Claims 28, 40, 41, 42, and 43 also includes similar features. For the reasons provided above in relation to Claim 1, Applicant demonstrates that this feature is neither taught nor suggested by Saito. Applicant respectfully requests reconsideration and allowance of Claims 8 and 28.

Additionally, Saito provides no suggestion or motivation to combine the teachings of the structure of the device shown in Figure 7 with the device having the stacked structure of Figure 9. Saito fails to disclose or suggest any reasons for combining the isolation region 71 disclosed in Figure 7 with a stacked structure, or with a stacked structure having portions of the substrate exposed in windows.

Discussion of Dependent Claims

Claims 3-4, 6-7, 9-12, and 45-48 depend from one of Claims 1, 8, or 44 and thus are believed to be allowable at least for the reason that they depend from allowable base claims. Applicant respectfully requests reconsideration and allowance of Claims 3-4, 6-7, 9-12, and 45-48.

Discussion of New Claims

Applicant has added new dependent Claims 49-60. The new claims add no new matter. Support for the new Claims can be found throughout the specification. In particular, support for Claims 49-50 can be found at page 10 ll. 15-19. Support for Claims 51-57 and 60 can be found at pages 9 line 18 through page 10 line 14. Support for Claims 58 can be found at page 4 ll. 20-23. Support for Claim 59 can be found at Fig. 2.

New Claims 49-60 are believed to be allowable at least for the reason that they depend from allowable base claims. Applicant respectfully requests allowance of Claims 49-60.

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CONCLUSION

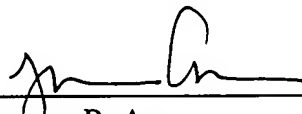
Applicant has endeavored to address all of the Examiner's concerns as expressed in the outstanding Office Action. Accordingly, amendments to the claims for patentability purposes pursuant to 35 U.S.C. §§ 102 and/or 112, the reasons therefor, and arguments in support of the patentability of the pending claim set are presented above. In light of these amendments and remarks, reconsideration and withdrawal of the outstanding rejections is respectfully requested. Applicant submits that the claim limitations discussed above represent only illustrative distinctions. Hence, there may be other patentable features that distinguish the claimed invention from the prior art.

If there are any impediments to allowance of the claims that can be resolved with a telephone call, the Examiner is respectfully invited to call the undersigned. Please charge any additional fees, including any fees for additional extension of time, or credit overpayment to Deposit Account No. 11-1410.

Respectfully submitted,

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Dated: 1/12/04

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